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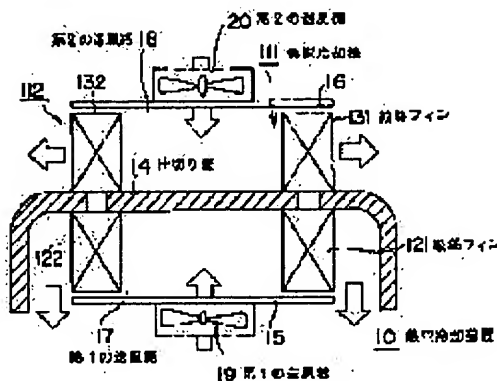
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(54) THERMOELECTRIC COOLING UNIT

(57)Abstract:

PURPOSE: To provide a thermoelectric cooling unit which cools a control board for computer incorporating a, heat source efficiently.

CONSTITUTION: The thermoelectric cooling unit comprises thermoelectric coolers 111, 132 each arranged in series with N type and P type thermoelectric elements wherein the coolers 111, 112 are provided with heat absorbing fins 121, 122 and heat radiating fins 131, 132 disposed on the opposite sides of a partition wall 14 having high thermal conductivity. First and second air channels 17, 18 are formed on the opposite sides of the partition wall 14 such that the heat absorbing fins 121, 122 and the heat radiating fins 131, 132 are disposed on the opposite sides thereof. Consequently, the hot air in a control board is introduced to the heat absorbing fins 121, 122 by means of a first fan 19 and the partition wall 14 whereas the outer air is introduced to the heat radiating fins 131, 132 by means of a second fan 20 and the partition wall 14. The air passed through the heat absorbing fins 121, 122 is introduced into the control board.



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CLAIMS

[Claim(s)]

[Claim 1] The thermoelement group constituted by arranging two or more N type thermoelements and P type thermoelements by turns, respectively, and carrying out series connection of each of the mutual with an endoergic electrode and a heat dissipation electrode, And the thermoelectric-cooling machine constituted including the endoergic heat exchange member and heat dissipation heat exchange member are combined with said endoergic electrode and a heat dissipation electrode in the condition with good heat conduction, and it was made to protrude towards a respectively opposite direction, While turning to said bridgewall the bridgewall constituted with the ingredient with good thermal conductivity set up so that said endoergic heat exchange member and heat dissipation heat exchange member of this thermoelectric-cooling machine might be divided, and the air from the part for cooling and applying them While introducing the 1st ventilation means which returns this air to said part for cooling through the endoergic heat exchange member part of said thermoelectric-cooling machine, and the open air and applying this open air towards said bridgewall The electric heat cooling system characterized by providing 2nd ventilation means by which this open air is discharged outside through the heat dissipation heat exchange member part of said thermoelectric-cooling machine.

[Claim 2] Thermoelectric-cooling equipment according to claim 1 with which the heat pipe was set up as open for free passage [with equipment] between the air induction from the part for cooling by the 1st ventilation means set up on both sides of said bridgewall, and the open air induction by the 2nd ventilation means.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to the control panel cooler which builds in the heat source of the computer for [various] control etc. and in which carries out a control box pair and it enabled it to apply effectively, and relates to the thermoelectric-cooling equipment using the thermoelement which consists of especially N type and P-type semiconductors.

[0002]

[Description of the Prior Art] If it is in the control panel equipped with the computer for control etc., in order to be in the situation that temperature becomes high and to operate a computer normally by generation of heat of the body section of a computer, it is necessary to cool the interior of a control box of the closed mold with which the control panel was set up. Although the air conditioner currently used for usual is applied as a means to cool the interior of a control box, for cooling especially the interior of a control box efficiently, it is unsuitable, and is in the inclination enlarged especially.

[0003] As a cooling system, the thermoelectrical-type cooling system shown in JP,5-63244,A is known. By carrying out series connection of the semiconductor device of N type and P type, and connecting those both ends to DC power supply, this cooling system applies the Peltier effect which produces an endoergic operation and a heat dissipation operation to the polar zone which connects both semiconductor devices, and is constituted. If it is in this thermoelectric-cooling equipment, it has the endoergic heat exchanger combined with the electrode which carries out endoergic in one, and the heat dissipation heat exchanger prepared in the electrode which radiates heat in one, and the cooling actuation by endoergic is controlled by control of DC power supply. Therefore, although it is effectively applicable to cooling in the sealed control box etc., a limitation is in refrigeration capacity by facing including especially in a control panel and receiving constraint in the physique, and the range applied is limited.

[0004]

[Problem(s) to be Solved by the Invention] This invention was made in view of the above points, and for example, it built in the computer for control which generates heat inside, as the heat of that interior can be emitted effectively, it tends to offer the thermoelectric-cooling equipment the cooling effect enabled it to fully demonstrate in a control panel like the control box of closed mold.

[0005]

[Means for Solving the Problem] The thermoelement group constituted by the thermoelectric-cooling equipment concerning this invention arranging two or more N type thermoelements and P type thermoelements by turns, respectively, and carrying out series connection of each of that mutual with an endoergic electrode and a heat dissipation electrode, And it is combined with said endoergic electrode and a heat dissipation electrode in the condition with good heat conduction. It has the thermoelectric-cooling machine constituted including the endoergic heat exchange member and heat dissipation heat exchange member it was made to protrude towards a respectively opposite direction. While dividing said endoergic heat exchange member and heat dissipation heat exchange member of this

thermoelectric-cooling machine with the bridgewall constituted with the ingredient with good thermal conductivity and applying the air from the part for cooling to said bridgewall with the 1st ventilation means While returning this air to said part for cooling through the endoergic heat exchange member part of said thermoelectric-cooling machine and applying the open air to said bridgewall with the 2nd ventilation means, this open air is made to be discharged outside through the heat dissipation heat exchange member part of said thermoelectric-cooling machine.

[0006]

[Function] Thus, if it is in the thermoelectric-cooling equipment constituted, while absorbing surrounding heat in an endoergic heat exchange member by impressing direct current voltage to the N type and the P type thermoelement which constitute a thermoelectric-cooling machine and which carried out series connection, in a heat dissipation heat exchange member, it comes to radiate heat around. And while the air heated for example, in the control box passes the endoergic heat exchange member section and is returned in said control box by the 1st ventilation means, by the 2nd ventilation means, the open air comes to be passed by the heat dissipation heat exchange member part, and heat exchange of the air introduced with the 1st and 2nd ventilation means is carried out in a bridgewall part. Therefore, once the air heated in the control box is cooled by the open air, it is further cooled by the endoergic heat exchange member, and is returned in a control box, and it is cooled efficiently and the air in a control box comes to be returned. For this reason, since there is nothing in a control panel like the control box of closed mold to enlarge especially the physique and internal heat can be effectively emitted for example, it built the computer for control which generates heat in the interior, the cooling effect fully comes to be demonstrated.

[0007]

[Example] Hereafter, one example of this invention is explained with reference to a drawing. Drawing 1 is what showed the cross-section configuration of thermoelectric-cooling equipment 10, and is the 1st and the 2nd thermoelectric-cooling machine 111. And 112 It is prepared. This thermoelectric-cooling machine 111 And 112 Endoergic fin 121 which constitutes an endoergic heat exchanger as protrudes on an opposite direction, respectively And 122 Radiation fin 131 which constitutes a heat dissipation heat exchanger And 132 It has. And these endoergic fins 121 and 122 A part and radiation fin 131 And 132 As a part is divided, a bridgewall 14 is set up, and this bridgewall 14 is constituted by the thermally conductive good ingredient which made board thickness thin, for example, copper.

[0008] that by which the 1st forced draft air duct 17 and 2nd forced draft air duct 18 are formed in the both sides of a bridgewall 14 by Septa 15 and 16 -- it is -- the both ends of each of this forced draft air duct 17 and 18 -- its it -- thermoelectric-cooling machine 111 And 112 Each endoergic fin 121 122 and radiation fin 131 132 It is arranged. The 1st blower 19 and 2nd blower 20 which ventilate towards the direction of a bridgewall 14, respectively are formed in a septum 15 and 16 parts. and the air introduced by the 1st blower 19 -- a bridgewall 14 -- hitting -- the 1st forced draft air duct 17 -- a passage -- endoergic fin 121 And 122 the air which passed, was discharged and was introduced by the 2nd blower 20 -- a bridgewall 14 -- hitting -- the 2nd forced draft air duct 18 -- a passage -- radiation fin 131 And 132 He passes and is trying to be discharged.

[0009] Thus, for the thermoelectric-cooling equipment 10 constituted, it is equipped to the control box 21 as shown by drawing 2 which built in the computer for control, and thermoelectric-cooling equipment 10 is the head-lining wall 221 of this control box 21. A part or side attachment wall 222 It is attached in a part. In this case, opening of the both sides of the 1st forced draft air duct 17 divided with the bridgewall 14 is carried out to the interior of a control box 21, and the both sides of the 2nd forced draft air duct 18 are wide opened by the open air. Here, it faces attaching in a control box 21, and a bridgewall 14 can use directly the side attachment wall of the control box 21 which is a candidate for cooling. Of course, the equipment shown by drawing 1 can be attached in the outside of the side attachment wall of a control box 21, and is attached in the interior of a side attachment wall, and you may make it open only the 2nd fresh air intake and exhaust port of a forced draft air duct 18 outside.

[0010] In this thermoelectric-cooling equipment 10, the open air is incorporated by the 2nd blower 20, and it is guessed by the bridgewall 14, and is a radiation fin 131 after that. And 132 The section is

passed and it is this radiation fin 131. And 132 The heat of the section is taken and it is emitted to the open air. Moreover, it is incorporated by the 1st blower 19, passes along the 1st forced draft air duct 17 in a bridgewall 14, and the air in a control box 21 is the endoergic fin 121. And 122 A part is passed and it is returned in a control box 21. Here, it is the endoergic fin 121. And 122 It faces passing and the heat of that passage air is the endoergic fin 121. And 122 It is taken, this cooled air is introduced in a control box 21, and that interior is cooled.

[0011] The concrete example of a configuration of the thermoelectric-cooling machine 11 (111 112) which carries out drawing 3 in this way, and is used in thermoelectric-cooling equipment 10 is shown, and this cooler 11 is equipped with the thermoelectrical conversion unit 30. This thermoelectrical conversion unit 30 is two or more N type thermoelements 311, 312, -- and the P type thermoelement 321, and 322, respectively. Having, such N type and the P type thermoelement 311, 312, --, 321, 322, and -- constitute the thermoelement group arranged by turns in serial along with one straight line.

[0012] The endoergic electrode plate 331, 332, -- and the heat dissipation electrode plate 341, 342, and -- intervene, by conductive low material or electroconductive glue, such as solder, it is combined in one and series connection of between the thermoelements which that ***** adjoins is electrically carried out between [each] the N type thermoelement 311 arranged by turns [this], 312, -- and the P type thermoelement 321, 322, and --, respectively. And in the both sides of this thermoelectrical conversion unit 30, it is a terminal 351, respectively. And 352 The DC power supply which are not prepared and illustrated are connected. Specifically, it is a terminal 351 about the forward side edge child of DC power supply. While connecting, it is a terminal 352 about a negative side terminal. It connects and is the P type thermoelement 321. A direct current is passed in serial from a side.

[0013] the N type thermoelement 311 by which series connection was carried out in the thermoelectrical conversion unit 30 which constitutes the thermoelectric-cooling machine 12, 312, and -- respectively -- since -- the P type thermoelement 321, 322, and -- the endoergic electrode plate 331 of NP joint with which it is alike, respectively and a current flows, 332, and -- part are made low temperature by the Peltier effect. moreover, the P type thermoelement 321, 322, and -- respectively -- since -- the N type thermoelement 311, 312, and -- the heat dissipation electrode plate 341 of the PN-junction section with which it is alike, respectively and a current flows, 342, and -- are made into a hot condition.

[0014] the endoergic electrode plate 331, 332, and -- plate 361 with which each consists of a good metal plate of the thermal conductivity of two sheets 362 It is constituted by sticking in the condition of having connected electrically. the same -- the heat dissipation electrode plate 241, 242, and -- plate 371 with which each consists of a good metal plate of the thermal conductivity of two sheets 372 It is constituted by sticking in the condition of having connected electrically.

[0015] Drawing 4 is the plate 361 corresponding to the endoergic electrode plate 331, 332, and --. 362 A part is taken out, and is decomposed and shown and the heat dissipation electrode plate 341, 342, and -- are a plate 371. And 372 The part is constituted similarly. That is, the N type thermoelement 311 and 362 are the polar zone 511 and 521. P type thermoelement 321 Endoergic electrode plate 331 inserted Plate 361 to constitute 362 It is a thermoelement 311, respectively. 321 Polar zone 511 located in between And 521 It has and is a plate 361. It is set up so that it may extend in the direction of a right angle from each section in the direction in which thermoelements 311 and 321 are located in a line. And this plate 361 And 362 From a thermoelement train, it is the location from which a few was separated, is mutually bent towards an opposite direction in the field which opposite-**, respectively, and the direction of a right angle, and is the 1st piece 512 of bending, respectively. And 522 is formed.

[0016] This 1st piece 512 of bending And 522 A thermoelement 311 and 321 It is the polar zone 511 further in the location equivalent to width of face. And 521 It is bent by the right angle in an parallel direction, i.e., the direction which separates from a thermoelement train, and is the 2nd piece 513 of bending. And 523 It forms. And this 2nd piece 513 of bending 523 It is the piece 514 of bending to the direction which faces a point mutually, respectively. And 524 It is formed.

[0017] Plate 361 362 Polar zone 511 And 521 It is joined in electric conduction with solder, and mutual is the endoergic electrode plate 331. It constitutes and is this endoergic electrode plate 331. It is the N type thermoelement 311 to both sides. And P type thermoelement 321 It is joined in electric conduction

with solder. Heat dissipation electrode plate 341 Since it is what the section consists of similarly, two or more N type thermoelements 311, 312, -- and the P type thermoelement 321, 322, and -- are arranged by turns, and also electrically series connection is carried out, and they come to constitute the thermoelectrical conversion unit 30, respectively.

[0018] namely, plate 361 constituted by this appearance 362 the endoergic electrode plate 331, 332, and -- constitute -- having -- moreover, plate 371 372 2nd piece 513 of bending which the heat dissipation electrode plate 341, 342, and -- come to be constituted, and is extended towards an outside 523 The endoergic fin 121 with which a part constitutes a heat exchanger, and 122 ** -- it is carried out. It is a plate 371 similarly. 372 In the part corresponding to the 2nd piece of bending, it is a radiation fin 131 and 132. It is constituted.

[0019] Plate 361 which constitutes each endoergic electrode plate 331, 332, and -- here, respectively 362 Although [each] a tooth back is opposite-**(ed) with the tooth back of the plate of an adjoining endoergic electrode plate, the mutual is joined by the insulating adhesives 381, 382, and -- in one so that it may insulate electrically. Plate 371 which constitutes each heat dissipation electrode plate 341, 342, and -- similarly, respectively 372 The tooth-back section is joined in electric insulation by the insulating adhesives 391, 392, and --.

[0020] Each plate 361 362 2nd piece 512 of bending 522 It is compared one by one. Moreover, plate 371 372 It is the 2nd piece 512 of bending, respectively. 522 A corresponding part is also compared one by one. It is what comes to form the N type thermoelement 311, 312, -- and the P type thermoelement 321, 322, and the partition wall of -- prolonged in parallel with the direction of an element array. The part of this partition wall is opposite-**(ed) by both sides of the bridgewall 14 of drawing 1 , and as an element array part penetrates a bridgewall 14, it is incorporated. The endoergic fin 121 and 122 Plate 361 to constitute Between 362, the pan radiation fin 131, and 132 Plate 371 to constitute 372 In between, the corrugated fins 40 and 41 intervene, respectively.

[0021] Thus, after the hot air in a control box 21 is inhaled in the 1st forced draft air duct 17 by the 1st blower 19 in the thermoelectric-cooling equipment 10 constituted and being directly guessed to a bridgewall 14, 90 degrees of that direction are changed, and it is the endoergic fin 121. And 122 It is turned to a direction. And this endoergic fin 121 And 122 The air by which heat was absorbed and cooled is returned in a control box 21, as an arrow head shows. Moreover, the open air is a radiation fin 131, after being introduced in the 2nd forced draft air duct 18 and hitting a bridgewall 14 with the 2nd blower 10. And 132 It is led to the section and is this radiation fin 131. And 132 After cooling, it is emitted to the open air.

[0022] Usually, when using such thermoelectric-cooling equipment, it is the endoergic fin 121. And 122 It is made to function as a cooler and heat exchange capacity of this endoergic fin 121 and 122 parts was made the capacity as a cooler by the endoergic effectiveness of a part. However, by constituting, as this drawing 1 shows, the air and the open air in a control box 21 which were heated come to be directly applied to both sides of a bridgewall 14, and a part of heating value in a control box 21 can emit outside through a bridgewall 14. Here, although the heat dissipation function which lets the wall surface of a control box 21 pass is considered from the former, as the example showed, it is that heat transfer by forced convection is made to be carried out by applying the elevated-temperature air and the open air in the direct box 21 to a bridgewall 14, and it compares calm and the marked heat dissipation engine performance can be secured.

[0023] furthermore, radiation fin 131 And 132 since it is that to which the airstream generated by the 2nd blower 20 circulates compulsorily into a part -- this radiation fin 131 and 132 carries out forced cooling -- having -- coming -- endoergic fin 121 And 122 The rise of temperature is controlled effectively and the endoergic effectiveness improves more. That is, the cooling effect is enlarged more, the physique of this thermoelectric-cooling equipment is made small, and the predetermined cooling effect comes to be acquired.

[0024] Drawing 5 shows the 2nd example and is set as the condition that the bridgewall 14 of thermoelectric-cooling equipment 10 is perpendicular. Therefore, the 1st and 2nd forced draft air ducts 17 and 18 set to both-sides side of this bridgewall 14 are also set up in the perpendicular condition, and

it corresponds to opening of the upper part of the 1st forced draft air duct 17, and a lower part.

Thermoelectric-cooling machine 111 And 112 It is each the endoergic fin 121. And 122 It is set up and corresponds to opening of the upper part of the 2nd forced draft air duct 18, and a lower part.

Thermoelectric-cooling machine 111 And 112 It is each a radiation fin 131. And 132 It comes to be set up, respectively.

[0025] And continuous foam sponge 23 is arranged to this perpendicular gravity direction down side of the thermoelectric-cooling equipment 10 by which a condition setup is carried out, and it is the endoergic fin 121. And 122 The water condensed in the part carries out natural fall on continuous foam sponge 23, and adhesion absorption is carried out at this continuous foam sponge 23. The moisture to which this continuous foam sponge 23 adhered permeates gradually towards a heat dissipation side, and, therefore, the 2nd forced draft air duct 18 evaporates in the style of heat dissipation. Processing of the drain water which always poses a problem in such a cooling system is performed in this continuous foam sponge 23 part, and it becomes unnecessary therefore, to install a drain water treatment device specially.

[0026] what penetrates a bridgewall 14 and formed the heat pipe 24 in the example shown by drawing 6 -- it is -- each of the both ends of this heat pipe 24 -- the heat exchange section is set as the interior of the 1st forced draft air duct 17 and the 2nd forced draft air duct 18.

[0027] Thus, as for this heat pipe 24, let elevated-temperature air from a control box which was introduced in the 1st forced draft air duct 17, and hung down with the 1st blower 19 be bottom heat in the heat exchange section of the lower part of a heat pipe 24 by constituting. This heat pipe 24 the elevated temperature which has the function which carries out heat transport efficiently, and heat exchange was carried out and was introduced in that lower part Are transported to the upper part of this heat pipe 24, and it is exposed to the open air introduced by the 2nd blower 20, and is cooled. The air which the air of the 1st forced draft air duct 17 was cooled as a result, and was cooled efficiently is sent out from the 1st forced draft air duct 17, and it is the endoergic fin 121. And 122 It minds and is introduced in a control box.

[0028] Here, when the interior of the control box which is a candidate for cooling should becomes lower than an OAT, a heat pipe 24 will be in the condition of top heat conversely, it considers as the condition that heat transport effectiveness is low, and the heat which invades in a control box through a heat pipe 24 for this reason is lessened.

[0029] In addition, although the example of the installation location to the control box 21 of this thermoelectric-cooling equipment 10 was shown in drawing 2, if it installs in the upper part which generally tends to be covered with hot air, the effectiveness of a bridgewall 14 is large. However, when a device especially with large calorific value is built in in a control box 21, a device with this large calorific value is approached, and you may make it install.

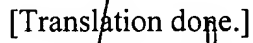
[0030]

[Effect of the Invention] According to the thermoelectric-cooling equipment applied to this invention as mentioned above, for example, it built in the computer for control which generates heat, by making it attach simply to this control panel in a control panel like the control box of closed mold, the heat inside a control box can be effectively emitted now, and that cooling effect can fully demonstrate.

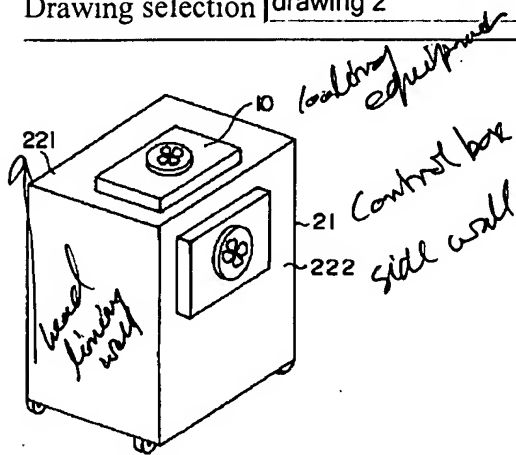
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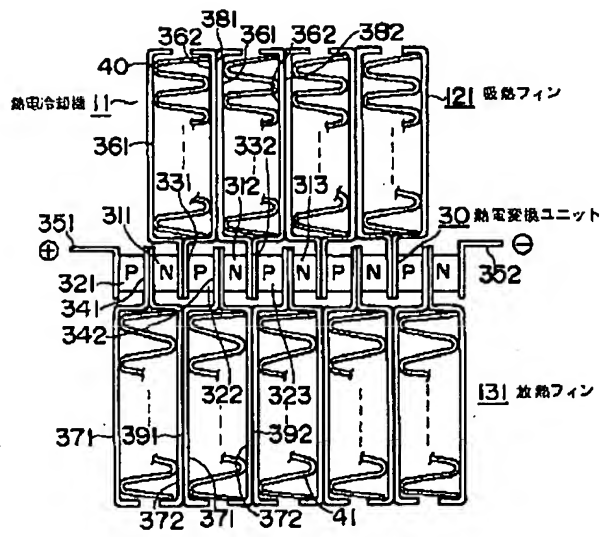
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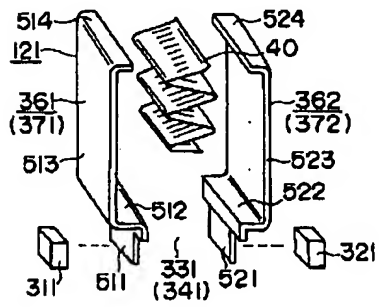

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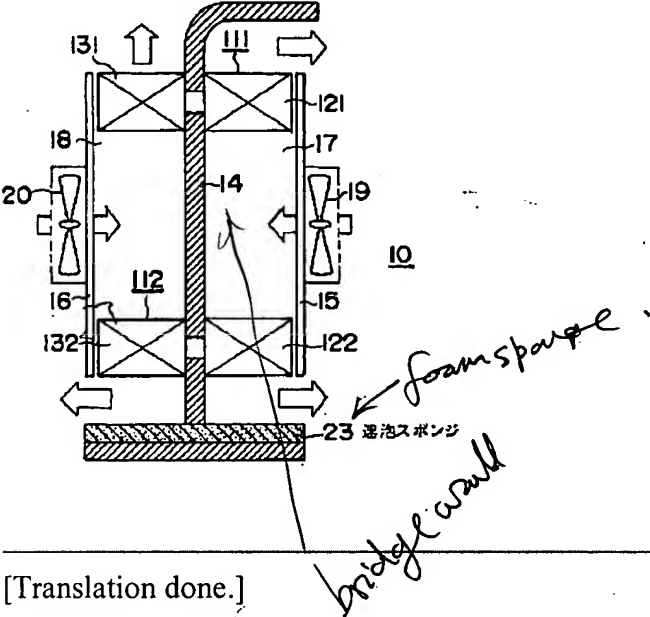
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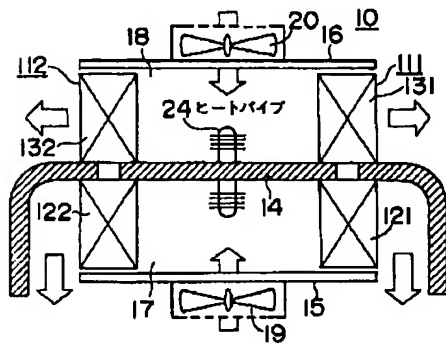

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